

Fig. 1A

Influenza matrix: wild type gene (for comparison)

agatctaaagatgagtccttctaaccgaggtcgaaacgtacgttctctcta
tcatcccgtcaggccccctcaaagccgagatcgacagagacttgaagat
gtctttgcaggggaagaacaccgatcttgaggttctcatggaatggctaaa
gacaagaccaatcctgtcacctctgactaaggggattttaggatttgtgt
tcacgctcaccggtgcccgtagcgaggactgcagcgtagacgctttgtc
caaatgcccttaatgggaacggggatccaaataacatggacaaagcagt
taaactgtataggaagctcaagagggagataacattccatggggccaaag
aatctcactcagttattctgctggtgcacttgccagttgtatgggcctc
atatacaacaggatgggggctgtgaccactgaagtggcatttggcctggt
atgtgcaacctgtgaacagattgctgactcccagcatcggtctcataggc
aaatggtgacaacaaccaaccactaatcagacatgagaacagaatggtt
ttagccagcactacagctaaggctatggagcaaattggctggatcgagtga
gcaagcagcagaggccatggaggttgctagtcaggctaggcaaattggtgc
aagcgatgagaaccattgggactcatcctagctccagtgctggtctgaaa
aatgatcttcttgaaaatttgaggcctatcagaaacgaatgggggtgca
gatgcaacgggttcaagtgaactag

Fig. 1B

Influenza matrix: protein sequence

MSLLTEVETYVLSIIPSGPLKAEIAQRLEDVFAGKNTDLEVLMEWLKTRP
ILSPLTKGILGFVFTLTVPSEGLQRRRFVQNALNGNGDPNNMDKAVKLY
RKLKREITFHGAKEISLSYSAGALASCMGLIYNRMGAVTTEVAFGLVCAT
CEQIADSQHRSHRQMVTNTNPLIRHENRMVLASTTAKAMEQMAGSSEQAA
EAMEVASQARQMVMQAMRTIGTHPSSSAGLKNDDLLENLQAYQKRMGVQMQR
FK*

Fig. 1C

Influenza matrix: gene with increased G/C content

agatctaaagatgagCctGctGaccgaggtGgaGacCtacgtGctGAGCa
tcatcccCAGCggccccctGaaGgccgagatcgcCagagGctGgaGgaC
gtGttCgcCggCaagaacaccgaCctGgaggtGctGatggaGtggctGaa
gacCagGccCatcctgAGCccCctgacCaagggCatCCTGggCttCgtgt
tcacCctGaccgtgcccagCgagcgCggCctgcagcgCCGCcgcttCgtG
caGaaCgccctGaaCggCaacggCgaCccCaaCaacatggacaaGgcCgt
GaaGctgtaCaggaagctGaagagggagatCacCttccaCggCgcaaGg
aGatcAGCctGagCtaCAGCgcCggCgcCctGgccagCtgCatgggcctG
atCtacaacaggatgggCgcCgtgaccacCgaGgtggcCttCggcctggt
GtgCgcCacctgCgaGcagatCgcCgacAGCcagcaCcgCAGCcaCaggc
aGatggtgacCacCaccaacccCctGatcagGcaCgagaacagGatggtG
CTGgccagcacCacCgcCaagggCatggagcaGatggcCggCAGCaGCga
gcaGgcCgcCgagggcatggaggtGgcCagCaggcCaggcaGatggtgc
aGgcCatgagGaccatCggCacCcaCccCagcAGCagCgcCggCctgaaG
aaCgaCctGctGgaGaaCCTGcaggcctaCcagaaGcgCatgggCgtgca
gatgcaGcgCttcaagtgaactagt

Fig. 1D

Influenza matrix: gene for secreted form (with N-terminal
signal sequence) with increased G/C content.

AgatctaaagatgGCCGTCATGGCCCCCGCACCCCTGGTGCTGCTGCTGA
GCGGCGCCCTGGCCCTGACCCAGACCTGGGCTagCctGctGaccgaggtG
gaGacCtacgtGctGAGCatcatcccCAGCggccccctGaaGgccgagat
cgcCagagGctGgaGgaCgtGttCgcCggCaagaacaccgaCctGgagg
tGctGatggaGtggctGaagacCagGccCatcctgAGCccCctgacCaag
ggCatCCTGggCttCgtgttcacCctGaccgtgcccagCgagcgCggCct
gcagcgCCGCcgcttCgtGcaGaaCgccctGaaCggCaacggCgaCccCa
aCaacatggacaaGgcCgtGaaGctgtaCaggaagctGaagagggagatC
acCttccaCggCgcaaGgaGatcAGCctGagCtaCAGCgcCggCgcCct
GgccagCtgCatgggcctGatCtacaacaggatgggCgcCgtgaccacCg
aGgtggcCttCggcctggtGtgCgcCacctgCgaGcagatCgcCgacAGC
cagcaCcgCAGCcaCaggcaGatggtgacCacCaccaacccCctGatcag
GcaCgagaacagGatggtGCTGgccagcacCacCgcCaagggCatggagc
aGatggcCggCAGCaGCgagcaGgcCgcCgagggcatggaggtGgcCagC
caggcCaggcaGatggtgcaGgcCatgagGaccatCggCacCcaCccCag
cAGCagCgcCggCctgaaGaaCgaCctGctGgaGaaCCTGcaggcctaCc
agaaGcgCatgggCgtgcagatgcaGcgCttcaagtgaactagt

Fig. 1E

Influenza matrix: mRNA with stabilisation sequences

```
GCUUGUUCUUUUUGCAGAAGCUCAGAAUAAACGCUCAACUUUGGCagauc
uaaagaugagucuuuaaaccgaggucgaaacguacguucucucuaucauc
ccgucaggccccucaaagccgagaucgcacagagacuugaagaugucuu
ugcaggggaagaacaccgaucuuagguucucauggaauaggcuaaagacaa
gaccaauccugucaccucugacuaaggggaauuuaggauuuguguucacg
cucaccgugcccagugagcgaggacugcagcguagacgcuuuguccaaaa
ugcccuuaaugggaacggggauccaaaauacauggacaaagcaguuaaac
uguauaggaagcucaagaggagauaacaauccauggggccaaagaauc
ucacucaguuaauucugcuggugcacuugccaguuguauggggccucauaa
caacagggaugggggugugaccacugcaguggcauuuuggccugguaugug
caaccugugaacagauugcugacucccagcaucgggucucuaaggc aaaug
gugacaacaaccaacccacuaaucagacaugagaacagaaugguuuuagc
cagcacuacagcuaaggcuauaggagcaaauggcuggaucgagugagcaag
cagcagaggccauggagguugcuagucaggcuaggcaaaugggucagcg
augagaaccauugggacucauccuagcuccagugcuggucugaaaauga
ucuucuuagaaaauuugcaggccuaucagaaacgaauugggggugcagaugc
aacgguucaagugaACUAGUGACUGACUAGCCCGUGGGCCUCCCAACGG
GCCCUCCUCCCUCCUUGCACCAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
```

Fig. 1F

Influenza matrix: mRNA with increased G/C content and stabilisation sequences

```
GCUUGUUCUUUUUGCAGAAGCUCAGAAUAAACGCUCAACUUUGGCagauc
uaaagaugagCcuGcuGaccgagguGgaGacCuacguGcuGAGCaucauc
ccCAGCggccccuGaaGgccgagaucgcCagagGcuGgaGgaCguGuu
CgcCggCaagaacaccgaCcuGgagguGcuGauggaGuggcuGaagacCa
gGccCauccugAGCccCcugacCaagggCauCCUGggCuuCguguucacC
cuGaccgugcccagCgagcgCggCcugcagcgCCGCcgcuuCguGcaGaa
CgcccGaaCggCaacggCgaCccCaaCaacauggacaaGgcCguGaaGc
uguaCaggaagcuGaagagggagauCacCuuccaCggCgcaaGgaGauc
AGCcuGagCuaCAGCgcCggCgcCcuGgccagCugCaugggccuGauCua
caacagggaugggCgcCgugaccacCgaGguggcCuuCggccugguGugCg
cCaccugCgaGcagauCgcCgacAGCagcaCcgCAGCcaCaggcaGaug
gugacCacCaccaacccCcuGaucagGcaCgagaacagGaugguGCUGgc
cagcacCacCgcCaagggCauggagcaGaugggCggCAGCaGCgagcaGg
cCgcCgaggccauggagguGgcCagCagggCaggcaGauggugcaGgcC
augagGaccuauCggCacCcaCccCagCAGCagCgcCggCcugaaGaaCga
CcuGcuGgaGaaCCUGcaggccuaCcagaaGcgCaugggCgugcagaugc
aGcgCuucaagugaACUAGUGACUGACUAGCCCGUGGGCCUCCCAACGG
GCCCUCCUCCCUCCUUGCACCAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
```

Influenza matrix: mRNA coding for secreted form with increased G/C content and stabilisation sequences

AAAAAAAAAAAA

Fig. 2A

MAGE1: wild type gene (for comparison)

```
catcatgtctcttgagcagaggagtctgcactgcaagcctgaggaagccc
ttgaggcccaacaagaggccctgggcctggtgtgtgtgcaggctgccacc
tctctctctctctctctggtcctgggcaccctggaggaggtgccactgc
tgggtcaacagatcctccccagagtcctcagggagcctccgcctttccca
ctaccatcaacttcactcgacagaggcaacccagtgagggttccagcagc
cgtgaagaggaggggccaagcacctcttgatatcctggagtccttggtccg
agcagtaatcactaagaaggtggctgatttggttggttttctgctcctca
aatatcgagccaggaggagccagtcacaaaggcagaaatgctggagagtgtc
atcaaaaattacaagcactgttttctgagatcttcggcaaagcctctga
gtccttgcaagctggtctttggcattgacgtgaaggaagcagacccaccg
gccactcctatgtccttgtcacctgcctaggtctctcctatgatggcctg
ctgggtgataatcagatcatgcccagacaggcttcctgataattgtcct
ggtcatgattgcaatggagggcgccatgctcctgaggaggaaatctggg
aggagctgagtgtgatggaggtgtatgatgggagggagcacagtgcctat
ggggagcccaggaagctgctcacccaagatttggtgcaggaaaagtacct
ggagtaccggcaggtgccggacagtgatcccgacgctatgagttcctgt
gggggtccaaggccctcgctgaaaccagctatgtgaaagtccttgagtat
gtgatcaaggtcagtgcaagagttcgctttttcttcccatccctgcgtga
agcagccttgagagaggaggaagaggaggtctgagcatga
```

Fig. 2B

MAGE1: protein sequence

SER, LEU, GLU, GLN, ARG, SER, LEU, HIS, CYS, LYS, PRO, GLU, GLU, ALA, LEU, GLU, ALA, GLN, GLN, GLU, ALA, LEU, GLY, LEU, VAL, CYS, VAL, GLN, ALA, ALA, THR, SER, SER, SER, SER, PRO, LEU, VAL, LEU, GLY, THR, LEU, GLU, GLU, VAL, PRO, THR, ALA, GLY, SER, THR, ASP, PRO, PRO, GLN, SER, PRO, GLN, GLY, ALA, SER, ALA, PHE, PRO, THR, THR, ILE, ASN, PHE, THR, ARG, GLN, ARG, GLN, PRO, SER, GLU, GLY, SER, SER, SER, ARG, GLU, GLU, GLU, GLY, PRO, SER, THR, SER, CYS, ILE, LEU, GLU, SER, LEU, PHE, ARG, ALA, VAL, ILE, THR, LYS, LYS, VAL, ALA, ASP, LEU, VAL, GLY, PHE, LEU, LEU, LEU, LYS, TYR, ARG, ALA, ARG, GLU, PRO, VAL, THR, LYS, ALA, GLU, MET, LEU, GLU, SER, VAL, ILE, LYS, ASN, TYR, LYS, HIS, CYS, PHE, PRO, GLU, ILE, PHE, GLY, LYS, ALA, SER, GLU, SER, LEU, GLN, LEU, VAL, PHE, GLY, ILE, ASP, VAL, LYS, GLU, ALA, ASP, PRO, THR, GLY, HIS, SER, TYR, VAL, LEU, VAL, THR, CYS, LEU, GLY, LEU, SER, TYR, ASP, GLY, LEU, LEU, GLY, ASP, ASN, GLN, ILE, MET, PRO, LYS, THR, GLY, PHE, LEU, ILE, ILE, VAL, LEU, VAL, MET, ILE, ALA, MET, GLU, GLY, GLY, HIS, ALA, PRO, GLU, GLU, GLU, ILE, TRP, GLU, GLU, LEU, SER, VAL, MET, GLU, VAL, TYR, ASP, GLY, ARG, GLU, HIS, SER, ALA, TYR, GLY, GLU, PRO, ARG, LYS, LEU, LEU, THR, GLN, ASP, LEU, VAL, GLN, GLU, LYS, TYR, LEU, GLU, TYR, ARG, GLN, VAL, PRO, ASP, SER, ASP, PRO, ALA, ARG, TYR, GLU, PHE, LEU, TRP, GLY, PRO, ARG, ALA, LEU, ALA, GLU, THR, SER, TYR, VAL, LYS, VAL, LEU, GLU, TYR, VAL, ILE, LYS, VAL, SER, ALA, ARG, VAL, ARG, PHE, PHE, PHE, PRO, SER, LEU, ARG, GLU, ALA, ALA, LEU, ARG, GLU, GLU, GLU, GLU, GLY, VAL, STP - , ALA, STP

Fig. 2C

MAGE1: mRNA with increased G/C content

augagccuggagcagcgcagccugcacugcaagccggaggaggcguggaggcgagcagga
ggcgugggccuggucugcguccaggcgggcgacgagcagcagcagcccgugguccugggca
cguggaggaggucccgacggcgggcagcacggacccgccgagagcccgagggcgcgagc
gcuucccgacgacgaucaacuucacgcgccagcgccagccgagcgagggcagcagcagccg
cgaggaggaggggcccgagcacgagcugcauccuggagagccuguuccgcgcggucaucaaga
agaaggugcgcgaccuggucggcuuccugcugcugaaguaccgcgcgcgcgagccggucacg
aaggcgaggaguggagagcgucaucaagaacuacaagcacugcuucccgagauucugg
caaggcgagcgagagccugcagcugugcuuccggcaucgacgcucaaggaggcgacccgacgg
gccacagcuacguccuggucacgugccuggggccugagcuacgacggccugcuggggcgacaac
cagaucaugccgaagacgggcuuccugaucaucguccuggucaugaucgggauggaggcg
ccacgcgcggaggaggagauucugggagcgagcugagcguaugaggagguacgacggccgcg
agcacagcgcguaacggcgagcccgcaagcugcugacgcaggaaccugguccaggagaaguac
cuggaguaccgccaggucccgacagcgacccggcgcgcuacgaguuccuguggggcccgcg
cgcgugggcgagacgagcuacgucuaagguccuggagucgucuaaaggucagcgcgcgcg
uccgcuucuuucccgagccugcgcgaggcgcgugcgcgaggaggaggaggcgucuga
gcgugauga

Fig. 2D

MAGE1: mRNA with alternative codon usage

augagccuggagcagcgcagccugcacugcaagcccgaggaggccuggaggccagcagga
ggcccgugggccuggugugcgugcaggccgccaccagcagcagcagcccccuggugcugggca
cccuggaggaggugcccaccggcgagcaccgacccccccagagccccaggggcgccagc
gccuuccccaccaccaucaacuucacccgccagcgccagcccgagggcagcagcagccg
cgaggaggaggggcccgacaccagcugcauccuggagagccuguuccgcgcggugauacca
agaaggugggccgaccuggugggcuuccugcugcugaaguaccgcgcggcgagcccgugacc
aaggccgagaugcuggagagcgugaucaagaacuacaagcacugcuucccgagauucugg
caaggccagcgagagccugcagcugguugucggcaucgacgugaaggaggccgacccaccg
gccacagcuacgugcuggugaccugccuggggccugagcuacgacggccugcuggggcgacaac
cagaucaugcccaagaccggcuuccugaucaucgugcugguugaugaucgccauggaggcg
ccacgccccgaggaggagauucugggaggagcugagcgugauggaggguacgacggccgcg
agcacagcgccuacggcgagccccgcaagcugcugacccaggaccuggugcaggagaaguac
cuggaguaccgccaggugcccgcagcgaccccgcccgcuaacgaguuccuguggggcccccg
cgcccgugggcgagaccagcuacgugaaggugcuggagucgugaucuaaggugagcgcccg
ugcgcuucuuucccgagccugcgcgaggccggcccgugcgcgaggaggaggaggcguguga
gccugauga